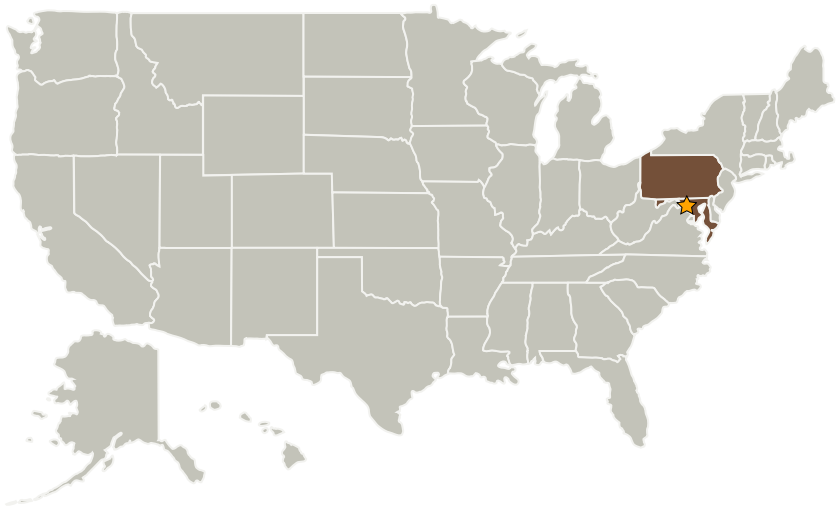
# Pressure Controlled Heat Pipe for Precise Temperature Control, Phase I

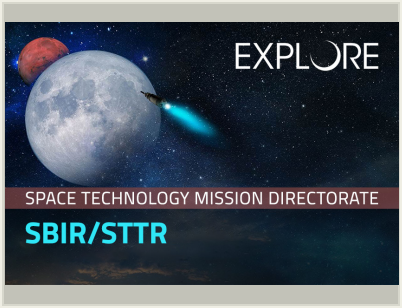
Completed Technology Project (2007 - 2007)

## Project Introduction

This Small Business Innovation Research project will develop Pressure Controlled Heat Pipes (PCHPs) for precise temperature control (milli-Kelvin level). Several optical systems, lasers, and detectors require tight temperature control to better than +/-1K. Some new missions even desire temperature control and thermal gradient control to the milli-Kelvin level. Typically precision temperature control is achieved by cold biasing the device and using electrical trim heaters. Variable conductance heat pipes are also used; however, the control band is not precise enough without unusually large reservoir volumes. The pressure controlled heat pipe has the potential to achieve precise temperature control without energy wasting control heaters and without unfavorable mass and volume reservoirs. PCHPs are essentially actively controlled VCHPs. In a PCHP, the control system senses an increase (or decrease) in pressure and actively changes either the gas charge in the reservoir or the volume of the reservoir to maintain the operating temperature precisely at the set point. The Phase I program will prove the feasibility of the PCHP concept. A prototype heat pipe will be built and tested. In Phase II, the integration and implementation of various control strategies will be performed.

## Primary U.S. Work Locations and Key Partners



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## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Goddard Space Flight Center (GSFC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

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| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Goddard Space Flight Center(GSFC) | Lead Organization | NASA Center | Greenbelt, Maryland |
| Advanced Cooling Technologies, Inc. | Supporting Organization | Industry | Lancaster, Pennsylvania |

| Primary U.S. Work Locations | |
|---|---|
| Maryland | Pennsylvania |

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

## Technology Areas

**Primary:**

- TX09 Entry, Descent, and Landing
  - TX09.4 Vehicle Systems
    - TX09.4.7 Guidance, Navigation and Control (GN&C) for EDL